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EXAMINER	
MERCEDES, DISMERY E	
ART UNIT	**PAPER NUMBER**
2651	

DATE MAILED: 12/03/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/679,696	SATO ET AL.	
	Examiner	Art Unit	
	Dismery E Mercedes	2651	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 October 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-40* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-40* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *10/07/2003* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *10/7/2003*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Information Disclosure Statement

1. The information disclosure statement (IDS) submitted on October 7,2003 is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Drawings

2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4), the motivation being because reference character "1" has been used to designate both magnetic recording medium and magnetic recording area. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

3. The abstract of the disclosure is objected to, the motivation being because the abstract should not exceed the range of 50-150 words.. Correction is required. See MPEP § 608.01(b).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1, 4, 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakajima et al. (US 5,656,385) in view Tanaka et al. (US 6,303,205 B1).

As to Claim 1, Nakajima et al. discloses a magnetic recording medium (col.3, line 4), comprising: a substrate (col.3, line 5); and a magnetic layer made of amorphous magnetic material, for magnetically recording information (col.3, lines 10-14).

Nakajima et al. fails to particularly point out the magnetic layer has bumps on a surface thereof, and density of the bumps is not less than 400 bumps/square microns.

However, Tanaka et al. discloses magnetic layer has bumps on a surface thereof (col.5, line 64), and density of the bumps is not less than 400 bumps/square microns (col.4, lines 57-58). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a protrusion density in the range as taught by Tanaka et al., the motivation being because as Tanaka et al. discloses, when the area ratio of the protrusions is smaller than 0.1% the region of the protrusions is easily abraded and the sliding durability deteriorates and floating stability may be lost. On the other hand, if the area ratio of the protrusions is larger than 80%, the effect to reduce the frictional force between the magnetic head and the magnetic disk decreases (col.9, lines 36-44 of Tanaka et al.).

As to Claim 4, Nakajima et al. further discloses a magnetic compensation temperature thereof is not less than 25 Celsius (col.3, lines 37-39).

As to Claim 5, Nakajima et al. further discloses a magnetic recording medium wherein the magnetic layer is to magnetically record the information by receiving heat and a magnetic field that are applied (col.4, lines 59-61, 65-68).

6. Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakajima et al. (US 5,656,385) in view Tanaka et al. (US 6,303,205 B1), further in view of Ikeda et al. (JP 5-282648).

As to Claim 2, Nakajima et al. and Tanaka et al. discloses the magnetic recording medium as set forth in base claim 1, but fail to particularly disclose a recording medium an underlayer is provided, made of nonmagnetic metal element, between the substrate and the magnetic layer.

However, Ikeda et al. discloses a recording medium an underlayer is provided, made of nonmagnetic metal element, between the substrate and the magnetic layer (abstract, lines 6-8). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the structure as taught by Ikeda et al., the motivation being because providing an underlayer with bumps on the surface between the magnetic layer and the surface would provide the magnetic recording medium of Nakajima et al. and Tanaka et al. from being absorbed by the magnetic head.

As to Claim 3, Ikeda et al. further discloses the nonmagnetic metal element is aluminum (abstract, lines 9-10).

7. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nakajima et al. (US 5,656,385) in view Tanaka et al. (US 6,303,205 B1), further in view of Ikeda et al. (JP 5-282648), further in view of Song et al. (US 6,472,049).

The combination of Nakajima et al., Tanaka et al. and Ikeda et al. disclosed the magnetic recording medium as set forth in claim 2, but fail to particularly disclose a surface thereof, and a compound made of (i) an element constituting the amorphous magnetic material and (ii) the nonmagnetic metal element is formed between the magnetic layer and the underlayer.

However, Song et al. discloses a compound constituting an element of amorphous magnetic material and nonmagnetic metal (col.4, line 10).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention, to use a compound as taught by Song et al., the motivation being because such compound would provide the magnetic recording medium of Nakajima et al., Tanaka et al. and Ikeda et al with the enhanced capability of increasing the coercivity of the magnetic recording medium to obtain higher density (col.4, lines 1-11 of Song et al.).

8. Claims 7, 10, and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakajima et al. (US 5,656,385) in view Tanaka et al. (US 6,303,205 B1).

As to Claim 7, Nakajima et al. discloses a magnetic recording medium (col.3, line 4), comprising: a substrate (col.3, line 5); and a magnetic layer made of amorphous magnetic material, for magnetically recording information (col.3, lines 10-14).

Nakajima et al. fails to particularly disclose the magnetic layer has bumps on a surface thereof, and height of the bumps is not less than 2% with respect to an average layer thickness of the magnetic layer.

However, Tanaka et al. discloses such on (col.15, line 4 and col.16, lines 6-7). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use the parameters as taught by Tanaka et al., the motivation being because it would provide the magnetic recording medium of Nakajima with the enhanced capability of obtaining good floating stability of the head, as well as good sliding durability performance (col.20, lines 51-55 of Tanaka et al.).

As to Claim 10, Nakajima et al. further discloses a magnetic compensation temperature thereof is not less than 25 Celcius (col.3, lines 37-39).

As to Claim 11, Nakajima et al. further discloses a magnetic recording medium wherein the magnetic layer is to magnetically record the information by receiving heat and a magnetic field that are applied (col.4, lines 59-61, 65-68).

9. Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakajima et al. (US 5,656,385) in view Tanaka et al. (US 6,303,205 B1), further in view of Ikeda et al. (JP 5-282648).

As to Claim 8, Nakajima et al. and Tanaka et al. discloses the magnetic recording medium as set forth in base claim 7, but fail to particularly disclose a recording medium an underlayer is provided, made of nonmagnetic metal element, between the substrate and the magnetic layer.

However, Ikeda et al. discloses a recording medium an underlayer is provided, made of nonmagnetic metal element, between the substrate and the magnetic layer (abstract, lines 6-8). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the structure as taught by Ikeda et al., the motivation being because providing an underlayer with

bumps on the surface between the magnetic layer and the surface would provide the magnetic recording medium of Nakajima et al. and Tanaka et al. from being absorbed by the magnetic head.

As to Claim 9, Ikeda et al. further discloses the nonmagnetic metal element is aluminum (abstract, lines 9-10).

10. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nakajima et al. (US 5,656,385) in view Tanaka et al. (US 6,303,205 B1), further in view of Ikeda et al. (JP 5-282648), further in view of Song et al. (US 6,472,049).

The combination of Nakajima et al., Tanaka et al. and Ikeda et al. disclosed the magnetic recording medium as set forth in claim 8, but fail to particularly disclose a surface thereof, and a compound made of (i) an element constituting the amorphous magnetic material and (ii) the nonmagnetic metal element is formed between the magnetic layer and the underlayer.

However, Song et al. discloses a compound constituting an element of amorphous magnetic material and nonmagnetic metal (col.4, line 10).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention, to use a compound as taught by Song et al., the motivation being because such compound would provide the magnetic recording medium of Nakajima et al., Tanaka et al. and Ikeda et al with the enhanced capability of increasing the coercivity of the magnetic recording medium to obtain higher density (col.4, lines 1-11 of Song et al.).

11. Claims 13, 16, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakajima et al. (US 5,656,385) in view Tanaka et al. (US 6,303,205 B1).

As to Claim 13, Nakajima et al. discloses a magnetic recording medium (col.3, line 4), comprising: a substrate (col.3, line 5); and a magnetic layer made of amorphous magnetic material, for magnetically recording information (col.3, lines 10-14).

Nakajima et al. fails to particularly point out the magnetic recording medium has bumps on a side of the magnetic layer, and density of the bumps is not less than 400 bumps/square microns.

However, Tanaka et al. discloses a magnetic recording medium wherein the magnetic layer has bumps on a surface (col.5, line 64), and density of the bumps is not less than 400 bumps/square microns (col.4, lines 57-58).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a protrusion density in the range as taught by Tanaka et al. the motivation being because as Tanaka et al. discloses, when the area ratio of the protrusions is smaller than 0.1% the region of the protrusions is easily abraded and the sliding durability deteriorates and floating stability may be lost. On the other hand, if the area ratio of the protrusions is larger than 80%, the effect to reduce the frictional force between the magnetic head and the magnetic disk decreases (col.9, lines 36-44 of Tanaka et al.)

As to Claim 16, Nakajima et al. further discloses a magnetic compensation temperature thereof is not less than 25 degrees Celsius (col.3, lines 37-39).

As to Claim 17, Nakajima et al. further discloses a magnetic recording medium wherein the magnetic layer is to magnetically record the information by receiving heat and a magnetic field that are applied (col.4, lines 59-61, 65-68).

12. Claims 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakajima et al. (US 5,656,385) in view Tanaka et al. (US 6,303,205 B1), further in view of Ikeda et al. (JP 5-282648).

As to Claim 14, Nakajima et al. and Tanaka et al. discloses the magnetic recording medium as set forth in base claim 13, but fail to particularly disclose a recording medium an underlayer is provided, made of nonmagnetic metal element, between the substrate and the magnetic layer.

However, Ikeda et al. discloses a recording medium an underlayer is provided, made of nonmagnetic metal element, between the substrate and the magnetic layer (abstract, lines 6-8). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the structure as taught by Ikeda et al., the motivation being because providing an underlayer with bumps on the surface between the magnetic layer and the surface would provide the magnetic recording medium of Nakajima et al. and Tanaka et al. from being absorbed by the magnetic head.

As to Claim 15, Ikeda et al. further discloses the nonmagnetic metal element is aluminum (abstract, lines 9-10).

13. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Nakajima et al. (US 5,656,385) in view Tanaka et al. (US 6,303,205 B1), further in view of Ikeda et al. (JP 5-282648), further in view of Song et al. (US 6,472,049).

The combination of Nakajima et al., Tanaka et al. and Ikeda et al. disclosed the magnetic recording medium as set forth in claim 14, but fail to particularly disclose a surface thereof, and

a compound made of (i) an element constituting the amorphous magnetic material and (ii) the nonmagnetic metal element is formed between the magnetic layer and the underlayer.

However, Song et al. discloses a compound constituting an element of amorphous magnetic material and nonmagnetic metal (col.4, line 10).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention, to use a compound as taught by Song et al., the motivation being because such compound would provide the magnetic recording medium of Nakajima et al., Tanaka et al. and Ikeda et al with the enhanced capability of increasing the coercivity of the magnetic recording medium to obtain higher density (col.4, lines 1-11 of Song et al.).

14. Claims 19, 22, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakajima et al. (US 5,656,385) in view Tanaka et al. (US 6,303,205 B1).

As to Claim 19, Nakajima et al. discloses a magnetic recording medium (col.3, line 4), comprising: a substrate (col.3, line 5); and a magnetic layer made of amorphous magnetic material, for magnetically recording information (col.3, lines 10-14).

Nakajima et al. fails to particularly disclose the magnetic recording medium has bumps on a side of the magnetic layer has bumps on a surface thereof, and height of the bumps is not less than 2% with respect to an average layer thickness of the magnetic layer.

However, Tanaka et al. discloses such (col.15, line 4 and col.16, lines 6-7).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to use the parameters as taught by Tanaka et al. the motivation being because it would provide the magnetic recording medium of Nakajima with the enhanced capability of obtaining

good floating stability of the head, as well as good sliding durability performance (col.20, lines 51-55 of Tanaka et al.).

As to Claim 22, Nakajima et al. further discloses a magnetic compensation temperature thereof is not less than 25 Celsius (col.3, lines 37-39).

As to Claim 23, Nakajima et al. further discloses a magnetic recording medium wherein the magnetic layer is to magnetically record the information by receiving heat and a magnetic field that are applied (col.4, lines 59-61, 65-68).

15. Claims 20 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakajima et al. (US 5,656,385) in view Tanaka et al. (US 6,303,205 B1), further in view of Ikeda et al. (JP 5-282648).

As to Claim 20, Nakajima et al. and Tanaka et al. discloses the magnetic recording medium as set forth in base claim 7, but fail to particularly disclose a recording medium an underlayer is provided, made of nonmagnetic metal element, between the substrate and the magnetic layer.

However, Ikeda et al. discloses bumps formed by providing an underlayer and a recording medium an underlayer is provided, made of nonmagnetic metal element, between the substrate and the magnetic layer (abstract, lines 6-8).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the structure as taught by Ikeda et al., the motivation being because providing an underlayer with bumps on the surface between the magnetic layer and the surface would provide the magnetic recording medium of Nakajima et al. and Tanaka et al. from being absorbed by the magnetic head.

As to Claim 21, Ikeda et al. further discloses the nonmagnetic metal element is aluminum (abstract, lines 9-10).

16. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nakajima et al. (US 5,656,385) in view Tanaka et al. (US 6,303,205 B1), further in view of Ikeda et al. (JP 5-282648), further in view of Song et al. (US 6,472,049).

The combination of Nakajima et al., Tanaka et al. and Ikeda et al. disclosed the magnetic recording medium as set forth in claim 20, a compound made of (i) an element constituting the amorphous magnetic material and (ii) the nonmagnetic metal element is formed between the magnetic layer and the underlayer.

However, Song et al. discloses a compound constituting an element of amorphous magnetic material and nonmagnetic metal (col.4, line 10).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention, to use a compound as taught by Song et al., the motivation being because such compound would provide the magnetic recording medium of Nakajima et al., Tanaka et al. and Ikeda et al with the enhanced capability of increasing the coercivity of the magnetic recording medium to obtain higher density (col.4, lines 1-11 of Song et al.).

17. Claims 25 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakajima et al. (US 5,656,385) in view Tanaka et al. (US 6,303,205 B1), further in view of Nishikawa et al. (US 2002/0081461 A1).

As to Claim 25, Nakajima et al. discloses a magnetic recording medium (col.3, line 4), comprising: a substrate (col.3, line 5); and a magnetic layer made of amorphous magnetic material, for magnetically recording information (col.3, lines 10-14).

Nakajima et al. fails to particularly point out the magnetic layer has bumps on a surface thereof, and density of the bumps is not less than 400 bumps/square microns.

However, Tanaka et al. discloses magnetic layer has bumps on a surface thereof (col.5, line 64), and density of the bumps is not less than 400 bumps/square microns (col.4, lines 57-58).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a protrusion density in the range as taught by Tanaka et al. the motivation being because as Tanaka et al. discloses, when the area ratio of the protrusions is smaller than 0.1% the region of the protrusions is easily abraded and the sliding durability deteriorates and floating stability may be lost. On the other hand, if the area ratio of the protrusions is larger than 80%, the effect to reduce the frictional force between the magnetic head and the magnetic disk decreases (col.9, lines 36-44 of Tanaka et al.)

Nakajima et al. also fails to particularly disclose a magnetic field application means for applying a magnetic field, which determines a magnetization direction to the magnetic layer, of the magnetic layer.

However, Nishikawa et al. discloses such on (page 4, ¶0064 & ¶0187, lines 14-17). It would have been obvious to use a magnetic field application means as taught by Nishikawa et al. the motivation being because it would provide the magnetic recording medium of Nakajima et al. with the enhanced capability of magnetizing regions in different directions (desired direction), thus tracking operation can be performed based on the difference in directions of the magnetized regions (page 15, ¶0194 of Nishikawa et al.).

As to Claim 26, Nishikawa further discloses heating means for locally heating the magnetic layer (page 14, ¶0183, line 4-5), wherein the magnetic field application means applies

the magnetic field, which determines the magnetization direction of the magnetic layer, to at least one part of a heated region in the magnetic layer, so that the magnetic layer magnetically records the information by receiving heat and a magnetic field that are applied (page 4, ¶0064 & ¶0187, lines 14-17).

18. Claims 27 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakajima et al. (US 5,656,385) in view Tanaka et al. (US 6,303,205 B1), further in view of Nishikawa et al. (US 2002/0081461 A1).

As to Claim 27, Nakajima et al. discloses a magnetic recording medium (col.3, line 4), comprising: a substrate (col.3, line 5); and a magnetic layer made of amorphous magnetic material, for magnetically recording information (col.3, lines 10-14).

Nakajima et al. fails to particularly point out the magnetic layer has bumps on a surface thereof, and density of the bumps is not less than 400 bumps/square microns and to particularly disclose the magnetic layer has bumps on a surface thereof, and height of the bumps is not less than 2% with respect to an average layer thickness of the magnetic layer.

However, Tanaka et al. discloses magnetic layer has bumps on a surface thereof (col.5, line 64), and density of the bumps is not less than 400 bumps/square microns (col.4, lines 57-58).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a protrusion density in the range as taught by Tanaka et al. the motivation being because as Tanaka et al. discloses, when the area ratio of the protrusions is smaller than 0.1% the region of the protrusions is easily abraded and the sliding durability deteriorates and floating stability may be lost. On the other hand, if the area ratio of the protrusions is larger than 80%,

the effect to reduce the frictional force between the magnetic head and the magnetic disk decreases (col.9, lines 36-44 of Tanaka et al.)

Tanaka et al. further discloses the magnetic layer has bumps on a surface thereof, and height of the bumps is not less than 2% with respect to an average layer thickness of the magnetic layer (col.15, line 4 and col.16, lines 6-7).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to use the parameters as taught by Tanaka et al. the motivation being because it would provide the magnetic recording medium of Nakajima with the enhanced capability of obtaining good floating stability of the head, as well as good sliding durability performance (col.20, lines 51-55 of Tanaka et al.).

Nakajima et al. also fails to explicitly disclose a magnetic field application means for applying a magnetic field, which determines a magnetization direction to the magnetic layer, of the magnetic layer.

However, Nishikawa et al. discloses such on (page 4, ¶0064 & ¶0187, lines 14-17). It would have been obvious to use a magnetic field application means as taught by Nishikawa et al. the motivation being because it would provide the magnetic recording medium of Nakajima et al. with the enhanced capability of magnetizing regions in different directions (desired direction), thus tracking operation can be performed based on the difference in directions of the magnetized regions (page 15, ¶0194 of Nishikawa et al.).

As to Claim 28, Nishikawa further discloses heating means for locally heating the magnetic layer (page 14, ¶0183, line 4-5), wherein the magnetic field application means applies the magnetic field, which determines the magnetization direction of the magnetic layer, to at

least one part of a heated region in the magnetic layer, so that the magnetic layer magnetically records the information by receiving heat and a magnetic field that are applied (page 4, ¶0064 & ¶0187, lines 14-17).

19. Claim 29 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakajima et al. (US 5,656,385) in view Tanaka et al. (US 6,303,205 B1), further in view of Nishikawa et al.

As to Claim 29, Nakajima et al. discloses a magnetic recording medium (col.3, line 4), comprising: a substrate (col.3, line 5); and a magnetic layer made of amorphous magnetic material, for magnetically recording information (col.3, lines 10-14).

Nakajima et al. fails to particularly point out the magnetic recording medium has bumps on a side of the magnetic layer, and density of the bumps is not less than 400 bumps/square microns.

However, Tanaka et al. discloses magnetic recording medium has bumps on a side of the magnetic layer (col.5, line 64), and density of the bumps is not less than 400 bumps/square microns (col.4, lines 57-58).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a protrusion density in the range as taught by Tanaka et al. the motivation being because as Tanaka et al. discloses, when the area ratio of the protrusions is smaller than 0.1% the region of the protrusions is easily abraded and the sliding durability deteriorates and floating stability may be lost. On the other hand, if the area ratio of the protrusions is larger than 80%, the effect to reduce the frictional force between the magnetic head and the magnetic disk decreases (col.9, lines 36-44 of Tanaka et al.)

Nakajima et al. also fails to particularly disclose a magnetic field application means for applying a magnetic field, which determines a magnetization direction to the magnetic layer, of the magnetic layer. However, Nishikawa et al. discloses such (page 4, ¶0064 & ¶0187, lines 14-17).

It would have been obvious to use a magnetic field application means as taught by Nishikawa et al. the motivation being because it would provide the magnetic recording medium of Nakajima et al. with the enhanced capability of magnetizing regions in different directions (desired direction), thus tracking operation can be performed based on the difference in directions of the magnetized regions (page 15, ¶0194 of Nishikawa et al).

As to Claim 30, Nishikawa further discloses heating means for locally heating the magnetic layer (page 14, ¶0183, line 4-5), wherein the magnetic field application means applies the magnetic field, which determines the magnetization direction of the magnetic layer, to at least one part of a heated region in the magnetic layer, so that the magnetic layer magnetically records the information by receiving heat and a magnetic field that are applied (page 4, ¶0064 & ¶0187, lines 14-17).

20. Claims 31,32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakajima et al. (US 5,656,385) in view Tanaka et al. (US 6,303,205 B1), further in view of Nishikawa et al. (US 2002/0081461 A1).

As to Claim 31, Nakajima et al. discloses a magnetic recording medium (col.3, line 4), comprising: a substrate (col.3, line 5); and a magnetic layer made of amorphous magnetic material, for magnetically recording information (col.3, lines 10-14).

Nakajima et al. fails to particularly point out the magnetic layer has bumps on a surface thereof, and height of the bumps is not less than 2% with respect to an average layer thickness of the magnetic layer.

Tanaka et al. further discloses the magnetic layer has bumps on a surface thereof, and height of the bumps is not less than 2% with respect to an average layer thickness of the magnetic layer (col.15, line 4 and col.16, lines 6-7).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to use the parameters as taught by Tanaka et al. the motivation being because it would provide the magnetic recording medium of Nakajima with the enhanced capability of obtaining good floating stability of the head, as well as good sliding durability performance (col.20, lines 51-55 of Tanaka et al.).

Nakajima et al. also fails to explicitly disclose a magnetic field application means for applying a magnetic field, which determines a magnetization direction to the magnetic layer, of the magnetic layer. However, Nishikawa et al. discloses such on (page 4, ¶0064 & ¶0187, lines 14-17).

It would have been obvious to use a magnetic field application means as taught by Nishikawa et al. the motivation being because it would provide the magnetic recording medium of Nakajima et al. with the enhanced capability of magnetizing regions in different directions (desired direction), thus tracking operation can be performed based on the difference in directions of the magnetized regions (page 15, ¶0194 of Nishikawa et al.).

As to Claim 32, Nishikawa further discloses heating means for locally heating the magnetic layer (page 14, ¶0183, line 4-5), wherein the magnetic field application means applies

the magnetic field, which determines the magnetization direction of the magnetic layer, to at least one part of a heated region in the magnetic layer, so that the magnetic layer magnetically records the information by receiving heat and a magnetic field that are applied (page 4, ¶0064 & ¶0187, lines 14-17).

21. Claims 33 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakajima et al. (US 5,656,385) in view Tanaka et al. (US 6,303,205 B1), further in view of Nishikawa et al.

As to Claim 33, Nakajima et al. discloses a magnetic recording device (col.3, line 4), comprising: a substrate (col.3, line 5); and a magnetic layer made of amorphous magnetic material, for magnetically recording information (col.3, lines 10-14).

Nakajima et al. fails to particularly point out the magnetic recording medium has bumps on a side of the magnetic layer, and density of the bumps is not less than 400 bumps/square microns.

However, Tanaka et al. discloses magnetic recording medium has bumps on a side of the magnetic layer (col.5, line 64), and density of the bumps is not less than 400 bumps/square microns (col.4, lines 57-58).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a protrusion density in the range as taught by Tanaka et al. the motivation being because as Tanaka et al. discloses, when the area ratio of the protrusions is smaller than 0.1% the region of the protrusions is easily abraded and the sliding durability deteriorates and floating stability may be lost. On the other hand, if the area ratio of the protrusions is larger than 80%,

the effect to reduce the frictional force between the magnetic head and the magnetic disk decreases (col.9, lines 36-44 of Tanaka et al.)

Nakajima et al. also fails to particularly disclose a magnetic field generator for applying a magnetic field, which determines a magnetization direction to the magnetic layer, of the magnetic layer. However, Nishikawa et al. discloses such on (page 4, ¶0064 & ¶0187, lines 14-17).

It would have been obvious to use a magnetic field application means as taught by Nishikawa et al. the motivation being because it would provide the magnetic recording medium of Nakajima et al. with the enhanced capability of magnetizing regions in different directions (desired direction), thus tracking operation can be performed based on the difference in directions of the magnetized regions (page 15, ¶0194 of Nishikawa et al.).

As to Claim 34, Nishikawa et al. further discloses heating means for locally heating the magnetic layer (page 14, ¶0183, line 4-5), wherein the magnetic field application means applies the magnetic field, which determines the magnetization direction of the magnetic layer, to at least one part of a heated region in the magnetic layer, so that the magnetic layer magnetically records the information by receiving heat and a magnetic field that are applied (page 4, ¶0064 & ¶0187, lines 14-17).

22. Claims 35 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakajima et al. (US 5,656,385) in view Tanaka et al. (US 6,303,205 B1), further in view of Nishikawa et al. (US 2002/0081461 A1).

As to Claim 35, Nakajima et al. discloses a magnetic recording medium (col.3, line 4), comprising: a substrate (col.3, line 5); and a magnetic layer made of amorphous magnetic material, for magnetically recording information (col.3, lines 10-14).

Nakajima et al. fails to particularly point out the magnetic layer has bumps on a surface thereof, and height of the bumps is not less than 2% with respect to an average layer thickness of the magnetic layer.

Tanaka et al. further discloses the magnetic layer has bumps on a surface thereof, and height of the bumps is not less than 2% with respect to an average layer thickness of the magnetic layer (col.15, line 4 and col.16, lines 6-7).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to use the parameters as taught by Tanaka et al. the motivation being because it would provide the magnetic recording medium of Nakajima with the enhanced capability of obtaining good floating stability of the head, as well as good sliding durability performance (col.20, lines 51-55 of Tanaka et al.).

Nakajima et al. also fails to explicitly disclose a magnetic field application means for applying a magnetic field, which determines a magnetization direction to the magnetic layer, of the magnetic layer. However, Nishikawa et al. discloses such on (page 4, ¶0064 & ¶0187, lines 14-17).

It would have been obvious to use a magnetic field application means as taught by Nishikawa et al. the motivation being because it would provide the magnetic recording medium of Nakajima et al. with the enhanced capability of magnetizing regions in different directions

(desired direction), thus tracking operation can be performed based on the difference in directions of the magnetized regions (page 15, ¶0194 of Nishikawa et al.).

As to Claim 36, Nishikawa further discloses heating means for locally heating the magnetic layer (page 14, ¶0183, line 4-5), wherein the magnetic field application means applies the magnetic field, which determines the magnetization direction of the magnetic layer, to at least one part of a heated region in the magnetic layer, so that the magnetic layer magnetically records the information by receiving heat and a magnetic field that are applied (page 4, ¶0064 & ¶0187, lines 14-17).

23. Claims 37 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakajima et al. (US 5,656,385) in view Tanaka et al. (US 6,303,205 B1), further in view of Nishikawa et al.

As to Claim 37, Nakajima et al. discloses a magnetic recording device (col.3, line 4), comprising: a substrate (col.3, line 5); and a magnetic layer made of amorphous magnetic material, for magnetically recording information (col.3, lines 10-14).

Nakajima et al. fails to particularly point out the magnetic recording medium has bumps on a side of the magnetic layer, and density of the bumps is not less than 400 bumps/square microns.

However, Tanaka et al. discloses magnetic recording medium has bumps on a side of the magnetic layer (col.5, line 64), and density of the bumps is not less than 400 bumps/square microns (col.4, lines 57-58).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a protrusion density in the range as taught by Tanaka et al. the motivation being

because as Tanaka et al. discloses, when the area ratio of the protrusions is smaller than 0.1% the region of the protrusions is easily abraded and the sliding durability deteriorates and floating stability may be lost. On the other hand, if the area ratio of the protrusions is larger than 80%, the effect to reduce the frictional force between the magnetic head and the magnetic disk decreases (col.9, lines 36-44 of Tanaka et al.)

Nakajima et al. also fails to particularly disclose a magnetic field generator for applying a magnetic field, which determines a magnetization direction to the magnetic layer, of the magnetic layer. However, Nishikawa et al. discloses such (page 4, ¶0064 & ¶0187, lines 14-17).

It would have been obvious to use a magnetic field application means as taught by Nishikawa et al. the motivation being because it would provide the magnetic recording medium of Nakajima et al. with the enhanced capability of magnetizing regions in different directions (desired direction), thus tracking operation can be performed based on the difference in directions of the magnetized regions (page 15, ¶0194 of Nishikawa et al.).

As to Claim 38, Nishikawa et al. further discloses heating means for locally heating the magnetic layer (page 14, ¶0183, line 4-5), wherein the magnetic field application means applies the magnetic field, which determines the magnetization direction of the magnetic layer, to at least one part of a heated region in the magnetic layer, so that the magnetic layer magnetically records the information by receiving heat and a magnetic field that are applied (page 4, ¶0064 & ¶0187, lines 14-17).

24. Claims 39 and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakajima et al. (US 5,656,385) in view Tanaka et al. (US 6,303,205 B1), further in view of Nishikawa et al. (US 2002/0081461 A1).

As to Claim 39, Nakajima et al. discloses a magnetic recording medium (col.3, line 4), comprising: a substrate (col.3, line 5); and a magnetic layer made of amorphous magnetic material, for magnetically recording information (col.3, lines 10-14).

Nakajima et al. fails to particularly point out the magnetic layer has bumps on a surface thereof, and height of the bumps is not less than 2% with respect to an average layer thickness of the magnetic layer.

Tanaka et al. further discloses the magnetic layer has bumps on a surface thereof, and height of the bumps is not less than 2% with respect to an average layer thickness of the magnetic layer (col.15, line 4 and col.16, lines 6-7).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to use the parameters as taught by Tanaka et al., the motivation being because it would provide the magnetic recording medium of Nakajima with the enhanced capability of obtaining good floating stability of the head, as well as good sliding durability performance (col.20, lines 51-55 of Tanaka et al.).

Nakajima et al. also fails to explicitly disclose a magnetic field generator for applying a magnetic field, which determines a magnetization direction to the magnetic layer, of the magnetic layer. However, Nishikawa et al. discloses such (page 4, ¶0064 & ¶0187, lines 14-17).

It would have been obvious to use a magnetic field application means as taught by Nishikawa et al., the motivation being because it would provide the magnetic recording medium of Nakajima et al. with the enhanced capability of magnetizing regions in different directions (desired direction), thus tracking operation can be performed based on the difference in directions of the magnetized regions (page 15, ¶0194 of Nishikawa et al.).

As to Claim 40, Nishikawa further discloses heating means for locally heating the magnetic layer (page 14, ¶0183, line 4-5), wherein the magnetic field application means applies the magnetic field, which determines the magnetization direction of the magnetic layer, to at least one part of a heated region in the magnetic layer, so that the magnetic layer magnetically records the information by receiving heat and a magnetic field that are applied (page 4, ¶0064 & ¶0187, lines 14-17).

Conclusion

25. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

Kirino et al. (US 2003/0157373 A1) for disclosing a magnetic recording medium, method of manufacture thereof, and magnetic recorder.

Gudeman et al. (US 5,949,612) for disclosing a low friction sliding hard disk drive system.

Yamazaki et al. (US 6,017,605) for disclosing a magnetic recording medium).

Uwazumi et al. (US 5,843,561) for disclosing a magnetic recording medium and method for manufacturing the same.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dismery E Mercedes whose telephone number is 703-306-4082. The examiner can normally be reached on Monday - Friday, from 9:00am - 4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sinh Tran can be reached on 703-305-4040. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Dismery E Mercedes
Examiner
Art Unit 2651

DM

W. R. YOUNG
PRIMARY EXAMINER